# Telehealth in Gestational diabetes (GDm-health)

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NHS Trust

NHS
National Institute for
Health Research

Gestational Diabetes

- New onset Diabetes in pregnancy

- Most common type of diabetes to complicate pregnancy

- Typically in 3rd Trimester

- Associated with

  – Obesity

  – Non-white ethnicity

  – Older maternal age

Glucose
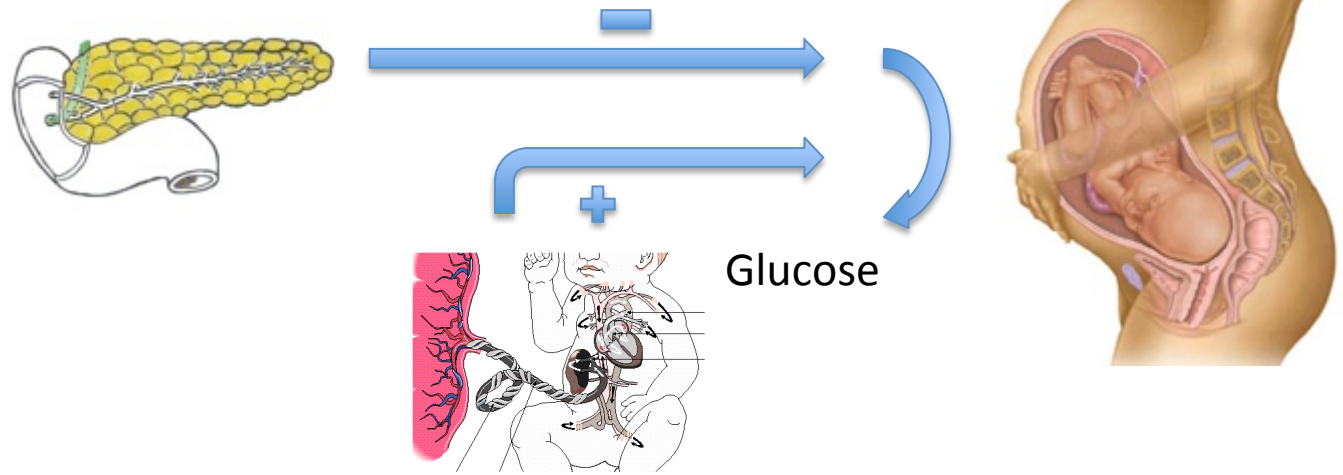
Affects of Diabetes on Pregnancy

Maternal and Fetal Risks	Neonatal risks
• Miscarriage • Congenital Malformations • Premature delivery • Polyhydramnios • Pre-eclampsia • Gestational Hypertension • Pyelonephritis • Hypoglycaemia (ass with maternal and fetal death) • Diabetic Ketoacidosis (50% fetal mortality) • Unexplained intra-uterine death – Rate 26.8 per 1000 (RR 4.7)[1]	• Birthweight (macrosomia and intrauterine growth restriction) • Respiratory Dysfunction • Hypoglycaemia • Polycythaemia and Jaundice • Necrotising entercolitis • Hypocalcaemia and Hypomagnesaemia

Motivation

- More women being tested[2]

- Stricter diagnostic criteria[3]

- Increasing prevalence 3.5% → 16%[1]

- Changing physiology
  - Frequent visits (2 weekly)

- Short time frame for intervention (10-12 weeks)

- Requirement for electronic capture of data

1. RCOG Scientific Impact Paper 23. (2011). Diabetes and Treatment of Gestational Diabetes. RCOG. UK.
2. Diabetes in Pregnancy. NICE CG63. 2008
3. IADPSG = International Association of Diabetes and Pregnancy Study Group

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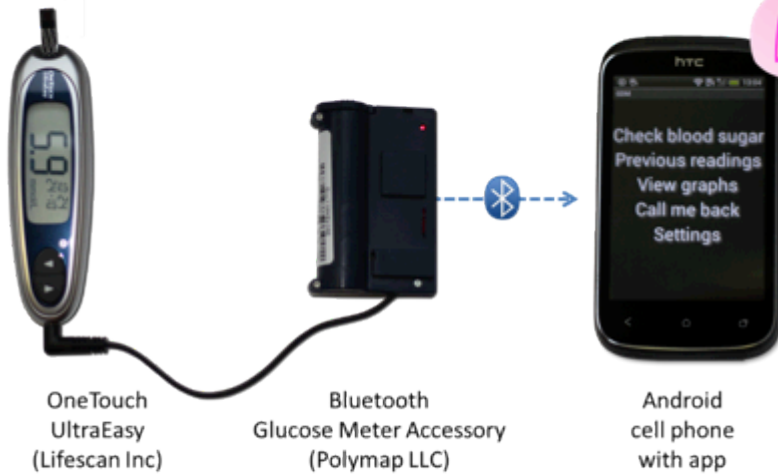| DAY		Pre-breakfast	2 hours after breakfast	Pre-lunch	2 hours after lunch	Pre-evening meal	2 hours after evening meal	Overnight	DYE Fer
MON Ⓐ Date: 21/1	Time	09:04	12:05	12:05		18:00			
	Glucose	4.6	7.7	7.7		5.0	missed		
	Fast insulin								
	Slow insulin								
	Notes								
TUES ⑤ Date: 22/1	Time	09:28	12:20 → 12.20	12.20	14:32	18:05	20:37		
	Glucose	4.0	4.5	4.5	5.6	4.4	6.8		
	Fast insulin								
	Slow insulin								
	Notes								
WED Date: 23/1	Time	08:15	10:40	12:30	15:34	18.07		12:28 (midnight)	
	Glucose	4.3	4.2	3.9	4.7	3.8	missed	4.2	
	Fast insulin								
	Slow insulin	.							
	Notes								
THURS Date: 24/1	Time	08:52	missed	12:05	14:49	missed	20:50		
	Glucose	3.9		4.2	4.2		8.2		
	Fast insulin								
	Slow insulin								
	Notes								
FRI ① Date: 18/1	Time	10:55	13:35 →		16.50	18:00	20:55		
	Glucose	4.2	4.8 →		6.4	4.3	5.6		
	Fast insulin								
	Slow insulin	.	.						
	Notes								
SAT ② Date: 19/1	Time	09:05	11:50	13.25	16:00	19:10	21.40		
	Glucose	3.9	4.9	3.9	4.8	4.8	7		
	Fast insulin								
	Slow insulin								
	Notes								
SUN ③ Date: 20/1	Time	09:18	11.35	13:15	16:00	18:37			
	Glucose	4.4	6.1	3.6	4.9	4.3			
	Fast insulin								
	Slow insulin								
	Notes								

Fast insulin: Slow insulin:

Sunday 20th Jan

Breakfast - 9.35am.
(OJ - enough to wash down 1 iron tablet)
Porridge with Sweetner

Lunch - 13.20pm.
Mushroom Soup (tinned). 2
Slices granary bread.

Snack - 16.15 pm
1 banana (small)

Dinner - 18.40 pm.
Cottage Pie + Kale.
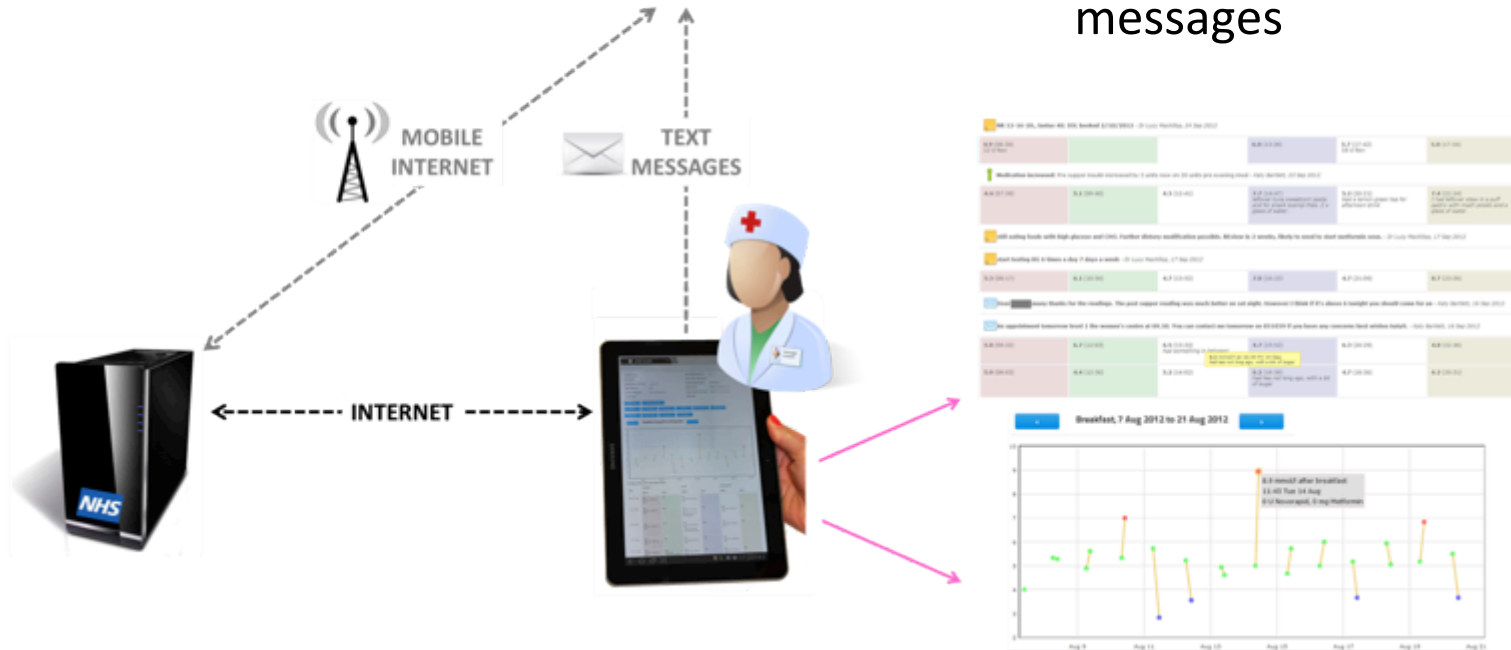
8.50pm 2 mouthfuls of OJ for
Iron tablet

⑤ Tuesday 22/1
Breakfast
Porridge, Sweetner + 1 mug
of coffee.

Lunch.
Tomato Soup (tinned) 2 slices
granary bread + spread.

13:35 - 1 mouthful of OJ for Iron tablet

Snack
1 sml apple.

Dinner (18:10)
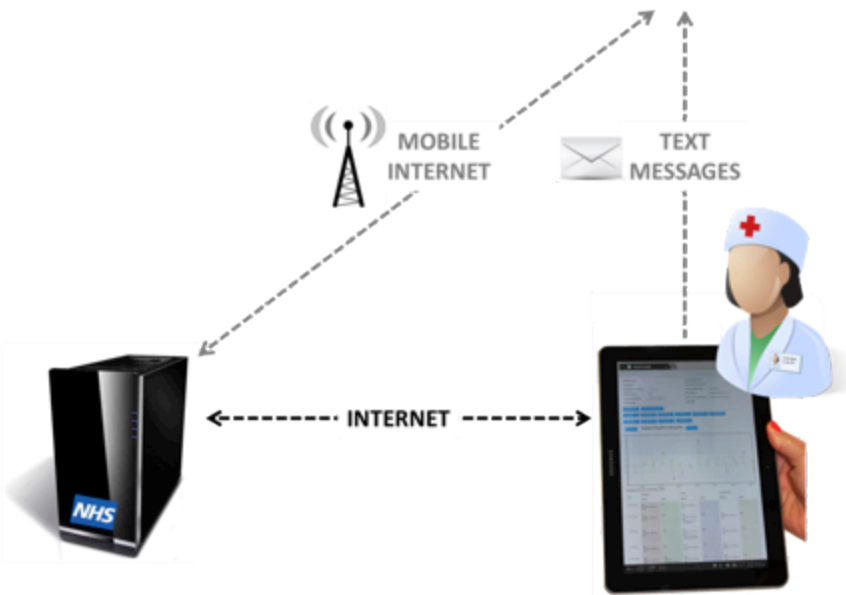Pasta, Sausage + beans + Veg.

1 mouthful of OJ - Iron tablet
(20:40)

How can we deliver intensive monitoring and management to more women while improving the quality of care?

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Healthcare professionals use the website to:

- *Review* submitted data

- *Automatic prioritization* of patients

- *Feedback* via text messages

Oxford University Hospitals **NHS** — NHS Trust

OneTouch UltraEasy (Lifescan Inc)

Bluetooth Glucose Meter Accessory (Polymap LLC)

Android cell phone with app

Check blood sugar
Previous readings
View graphs
Call me back
Settings

MOBILE INTERNET

TEXT MESSAGES

INTERNET

Patients use the phone app to:

- *Annotate* SMBG data with meal tags, medication doses and other comments

- *Review* previous data graphically

- *Request* a call back from the midwife

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Medication adjustments in response to BG

Pre-lunch medication and post-lunch blood glucose
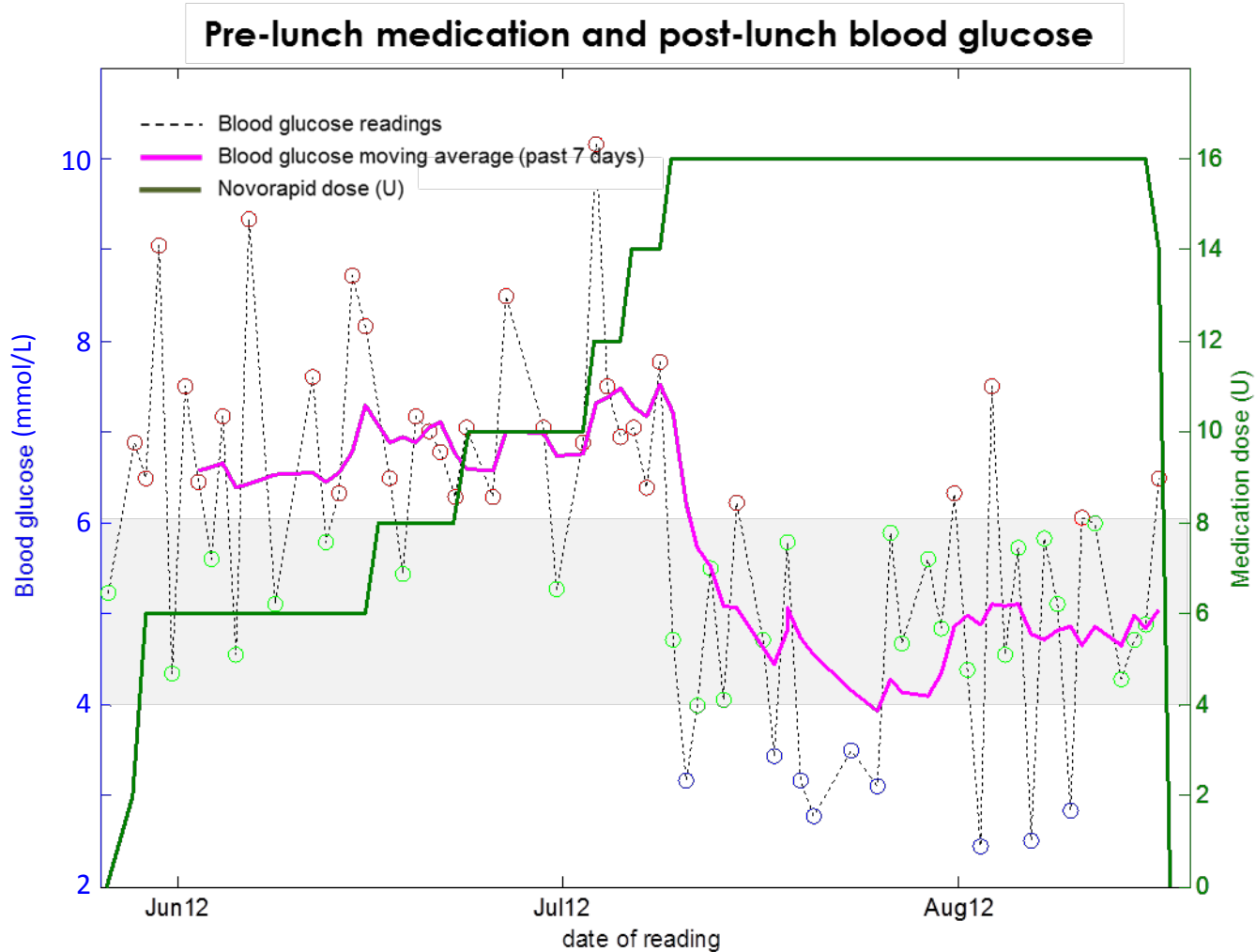
Service Development Project

49 patients at two hospitals have used the system

Total usage: 621 patient-weeks.

17,610 **blood glucose results** transmitted:

- 97% included a **meal label**;
- 16% included **free text comments** from the patient about diet or other aspects of self-management

466 **text messages** sent to patients from care team (including 123 medication adjustments).

Patients reported that the system is **convenient** (48/49) and **fitted with their lifestyle** (47/49).

Patient comments

"I am finding it very good, it is very convenient. I sent [the midwife] a text message and she called me. I like the graphs, you know, the colours are good, you know the red when it is too high."

"I am very happy with it, it is really good. I will miss it. It was very good to get positive messages [from the midwife]."

"I used to worry that I would lose bits of paper, as I am working and check my sugars at work.   [The midwife] called and already knew all my numbers."

"The reminder function is useful, life is very busy with this one [picks up three year old child]. I think it is very convenient."

Randomised controlled trial

- 200 women randomised to :
- intervention + clinic visits **reduced by half**
  versus
- conventional care
- Primary Outcome – markers of glycaemic control
  – HbA1c
  – Mean blood glucose
- Secondary Outcomes
  – Cost evaluation
  – Clinical outcome data
- Registered as NCT01916694 at http://clinicaltrials.gov

Summary

- Use of new technologies for the management of GDM

- Telehealth system tested successfully within one Trust

- High patient and provider satisfaction

- Opportunity for implementation with partners within the OxAHSN

Advantages:
- ✓ Rapid transmission and feedback
- ✓ Electronic transfer of data
- ✓ Flexibility of display
- ✓ More information recorded
- ✓ Easier to target patients who require extra support/intervention

GDm-health Team

- Dr Lucy Mackillop -Women's Centre, Oxford University Hospitals
- Dr Jane Hirst
- Sr Katy Bartlett
- Sr Yvonne Kenworthy
- Sr Tessa Snelgar
- Dr Dev Kevat

- Prof Tarassenko – Institute of Biomedical Engineering
- Dr Oliver Gibson
- Ms Lise Loerup

- Dr Jonathan Levy - OCDEM
- Prof Andrew Farmer - DPHPC